

CLAIMS

1. A method of manufacturing a photomultiplier tube having a faceplate (3), a photocathode (3a) for emitting electrons in response to light incident on the faceplate (3),
5 an electron multiplying section (9) for multiplying the electrons emitted from the photocathode (3a), an anode (12) for outputting an output signal based on the electrons multiplied by the electron multiplying section (9), a stem plate (4) for fixedly supporting the electron multiplying
10 section (9) and the anode (12) with stem pins (10), and a side tube (2) with the stem plate (4) fixed on one open end and the faceplate (3) fixed on the other open end and enclosing the electron multiplying section (9) and the anode (12), the method characterized by the steps of:

15 providing a metal side tube (2) formed of metal and a stem plate (4) such that at least a portion contacting the metal side tube (2) is formed of metal;

aligning the metal side tube (2) with the stem plate (4) so that an outer edge of the stem plate (4) does not
20 protrude further externally than an outer surface of the metal side tube (2); and

fusing the metal side tube (2) to the stem plate (4) at a point of contact (F) between the metal side tube (2) and the stem plate (4) by laser welding or electron beam
25 welding to form an airtight vessel.

2. The method of manufacturing a photomultiplier tube as recited in claim 1, characterized in that the metal side tube (2) is engaged with the stem plate (4) such that only the outer surface of the metal side tube (2) is exposed on an outer surface of the airtight vessel formed from the metal side tube (2) and the stem plate (4) by laser welding or electron beam welding.

3. The method of manufacturing a photomultiplier tube as recited in claim 1, characterized in that the metal side tube (2) is engaged with the stem plate (4) such that the outer surface of the metal side tube (2) and at least a portion of an outermost edge of the stem plate (4) are exposed on an outer surface of the airtight vessel formed from the metal side tube (2) and the stem plate (4) by laser welding or electron beam welding.

4. A photomultiplier tube including a faceplate (3), a photocathode (3a) for emitting electrons in response to light incident on the faceplate (3), an electron multiplying section (9), disposed inside an airtight vessel (5), for multiplying the electrons emitted from the photocathode (3a), and an anode (12) for outputting an output signal based on the electrons multiplied by the electron multiplying section (9), characterized in that the airtight vessel (5) comprises:

a stem plate (4) for fixedly supporting the electron

multiplying section (9) and the anode (12) with stem pins (10);

a metal side tube (2) with the stem plate (4) fixed on one open end, and enclosing the electron multiplying section (9) and the anode (12); and

a faceplate (3) fixed on the other open end of the metal side tube (2),

wherein the stem plate (4) is welded on the one open end of the metal side tube (2), a top surface (4C) of the stem plate (4) contacting a bottom end of the metal side tube (2) such that an outer surface (2b) of the metal side tube (2) is flush with an edge surface (4b) of the stem plate (4), at least a portion of the top surface (4C) of the stem plate (4) in contact with the metal side tube (2) being formed of metal.

5. The photomultiplier tube as recited in claim 4, characterized in that a cutout portion (20a, 40d) is formed in the top surface (4C) on an edge of the stem plate (4) for supporting the bottom end (2a) of the metal side tube (2).

6. The photomultiplier tube as recited in claim 4, characterized in that the metal side tube (2) is fusion welded to the stem plate (4).

7. The photomultiplier tube as recited in any one of claims 4 through 6, characterized in that the fusion welding is laser welding or electron beam welding.

8. The photomultiplier tube as recited any one of claims 4 through 7, characterized in that entirety of the stem plate (4) is formed of metal.

9. The photomultiplier tube as recited any one of claims 4 through 8, characterized in that the stem plate (4) comprises a metal stem support member (40), and a glass stem plate (41), the metal stem support member (40) being in contact with the bottom end of the metal side tube (2) extending substantially in an axial direction of the metal side tube (2).

10. A radiation detector including a scintillator (56) for emitting fluorescent light in response to radiation generated from an object (P) of analysis, a plurality of photomultiplier tubes (1), each having a faceplate (3) disposed in opposition to the scintillator (56), for outputting electric charges based on fluorescent light emitted from the scintillator (56), and a position calculating section (59) for performing calculations on the electric charges output from the plurality of photomultiplier tubes (1) and outputting positioning signals of radiation issued in the object (P) of analysis, characterized in that each of the plurality of the photomultiplier tubes (1) comprises:

a photocathode (3a) for emitting electrons in response to light incident on the faceplate (3);

an electron multiplying section (9), disposed inside an airtight vessel (5), for multiplying the electrons emitted from the photocathode (3a); and

5 an anode (12) for outputting an output signal based on the electrons multiplied by the electron multiplying section (9), and

the airtight vessel (5) comprises:

10 a metal stem plate (4) for fixedly supporting the electron multiplying section (9) and the anode (12) with stem pins (10);

15 a metal side tube (2) with the metal stem plate (4) fixed on one open end, and enclosing the electron multiplying section (9) and the anode (12), wherein the metal stem plate (4) is fixed by welding to the metal side tube (2) such that an outermost edge of the metal stem plate (4) does not protrude outward from an outer surface of the metal side tube (2); and

the faceplate (3) fixed on the other open end of the metal side tube (2).